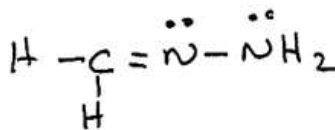
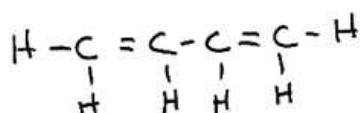
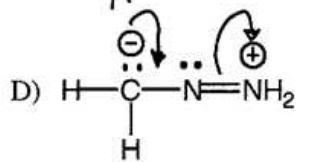
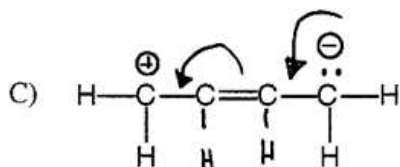
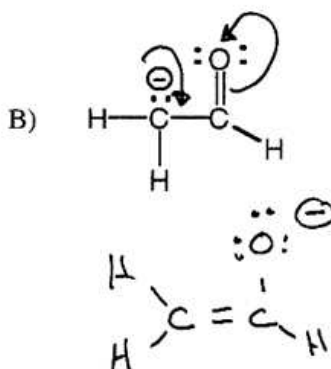
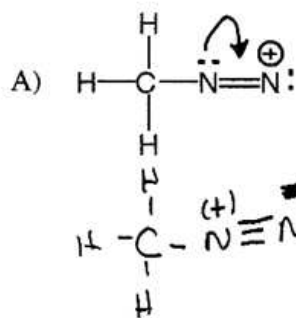
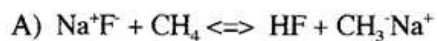


Problem 1. (10 points) Keeping the same atomic connections and only moving electrons, write a more stable Lewis structure for each of the following molecules. Be sure to note any charge on the atoms.



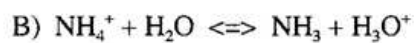
Problem 2 (15 points) For the following reactions, does the equilibrium for the reaction lie toward the reactant side of the product side?

Circle One



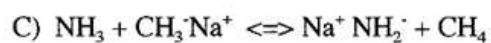
reactant

product



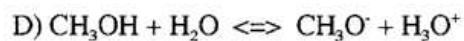
reactant

product



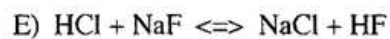
reactant

product



reactant

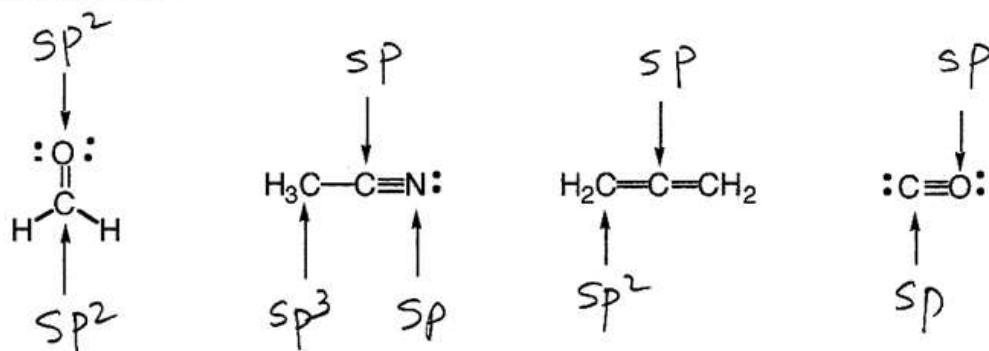
product



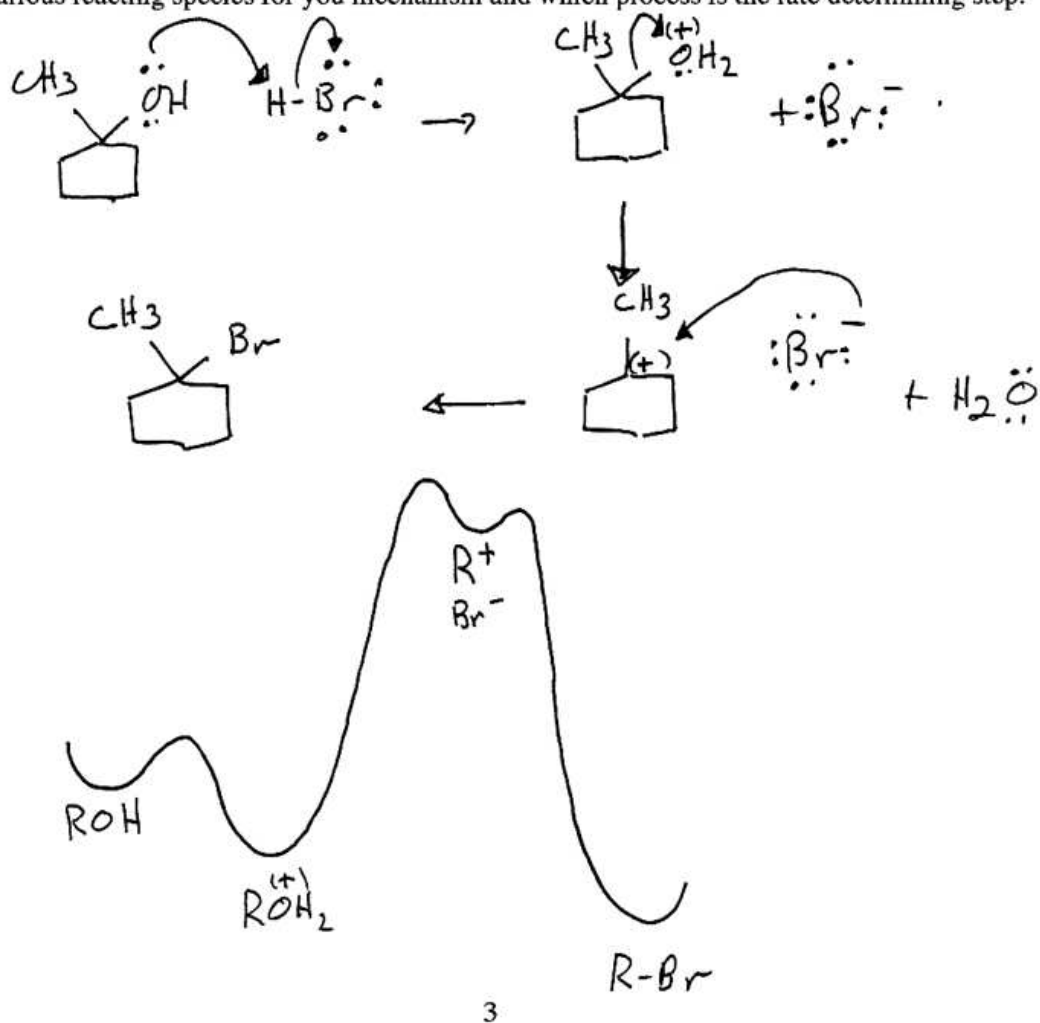
reactant

product

Problem 3. (10 points) Give the orbital hybridization for each of the indicated atoms in the following molecules.



Problem 4 (15 points) Give each step in the reaction mechanism and draw the potential energy diagram for the reaction of 1-methyl-cyclohexanol with HBr. On the energy diagram indicate the various reacting species for you mechanism and which process is the rate determining step.

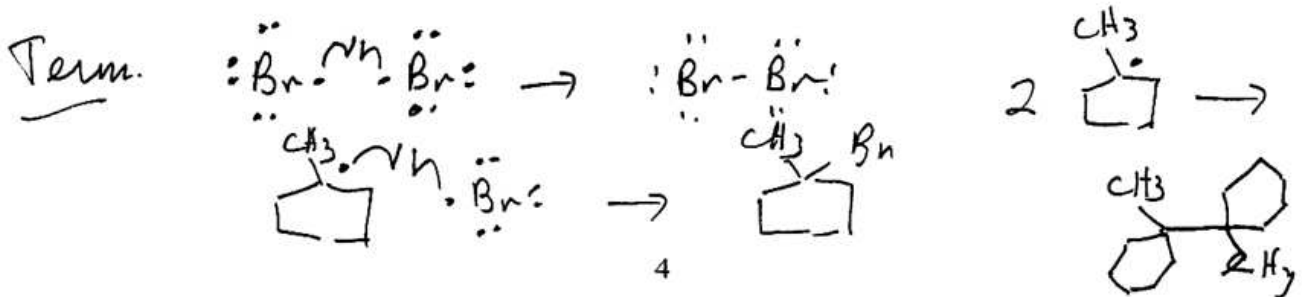
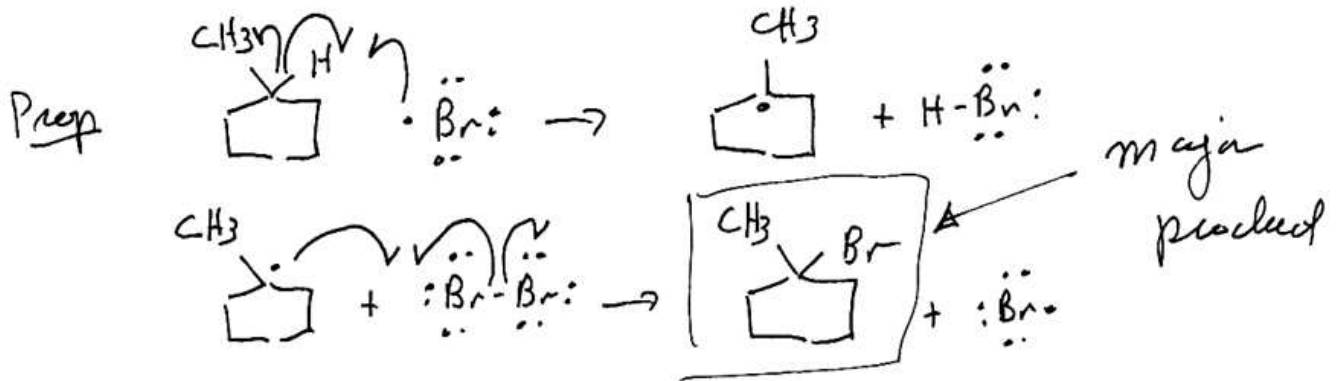
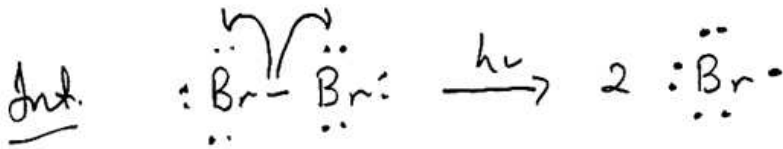


Problem 5 (10 points) Within the context of the SN1 reaction mechanism, explain why the reaction of tertiary alcohol proceeds faster than a primary alcohol in the presence of HCl.

In SN1, RDS is formation of cation -
the cation from 3° ROH is more stable than from 1° ROH

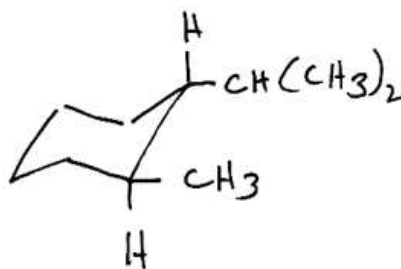
The reason 3° cation is more stable than 1° cation is an increase in hyperconjugation and the inductive effect

Problem 6. (15 points) When Br₂ reacts with 1-methyl-cyclohexane in the presence of light, one major product is formed. What is that product? Given the mechanism for the reaction.

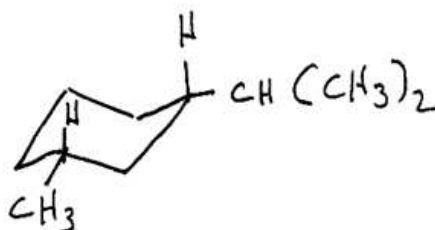


Problem 7. (15 points) Identify the more stable stereoisomer in each of the following pairs and draw the structure of the most isomer.

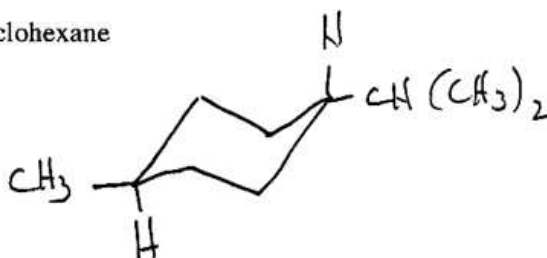
A) cis or trans -isopropyl-2-methylcyclohexane.



B) cis or trans 1-isopropyl-3-methylcyclohexane



C) cis or trans 1-isopropyl-4-methylcyclohexane



Problem 8. (10 points) Consider the orbital overlaps for the pair of orbitals listed below. Indicate whether they are bonding, non-bonding or antibonding.

